On the thermodynamics ...

concentration is calculated for some binary solid solutions
(1) $Ba(Ti,Sn)O_3$;   (2) $Ba(Ti,Zr)O_3$;   (3) $(Ba,Sr)TiO_3$;
(4) $(Pb,Sr)TiO_3$;   (5) $(Ba,Pb)TiO_3$.   For small concentrations the
temperature of the phase transition Θ for solid solutions is
given by

$$\Theta = \Theta_o - \sum_{i=1}^{n} a_i x_i \qquad (1)$$

where x_i is the molecular concentration of the added component;
a_i is the derivative of Θ with respect to x_i, and
$\Theta_o = \Theta_{x_1=x_2=\ldots x_n = o}$.   In the simpler case of phase
transitions of the second kind an expression is obtained for the
dependence of the coefficient α on concentration for constant
temperature and pressure.

$$\alpha = \alpha_o'(T - \Theta_o + ax) \qquad (7)$$

After a detailed analysis for transitions of the first kind an
Card 2/3

On the thermodynamics ...

S/139/62/000/002/018/028
E039/E435

an expression is obtained relating electrostriction with the composition of solid solutions.   There are 2 figures.

ASSOCIATION: Rostovskiy-na-Donu gosuniversitet
              (Rostov-on-Don State University)

SUBMITTED: October 26, 1960 (initially)
              September 4, 1961 (after revision)

Card 3/3

S/070/62/007/004/008/016
E132/E435

AUTHOR: Granovskiy, V.G.

TITLE: The character of the chemical bonds in ferroelectric crystals of the ABO_3 perovskite type

PERIODICAL: Kristallografiya, v.7, no.4, 1962, 604-608

TEXT: The magnitudes of the effective charges on the ions in ferroelectric perovskite type crystals are estimated and from these the covalent radii of the ions are calculated and the dependence on composition of the temperature of the phase transitions is qualitatively discussed. The distribution of lines of force between the ions is calculated according to Pauling's rules. As the O ions screen the two types of cations from each other, the A-B interactions are neglected but O-O interactions are included. The effective charges are thus calculated and by R. Sanderson's formula (J. Chem. Phys. v.24, 1956, 166) the ionic radii are calculated by $Zr^{-3} = 4.19$ PE where P is the electron density of the isoelectronic gas (interpolated between the actual rare gases if necessary) and E is the electronegativity of the ion. The data (tabulated) confirm the hypothesis of a considerable covalent

Card 1/2

The character of the chemical ...

S/070/62/007/004/008/016
E132/E435

character in the bonding.   With increasing covalent character
the transition temperature from the ferroelectric state to the
paraelectric would be expected to increase.   There are 2 tables.

ASSOCIATION: Rostovskiy-na-Donu gosudarstvennyy universitet
              (Rostov-on-Don State University)

SUBMITTED: October 26, 1961

Card 2/2

L 13082-65   EWT(1)/EPA(s)-2/EEC(t)/EEC(b)-2
ASD(f)-2/ASD(a)-5/AFWL/ESD(gs)/ESD(t)   GG   Pt-10/P1-4   IJP(c)/SSD/AFETR/
ACCESSION NR: AP4047360

S/0139/64/000/005/0131/0134

AUTHOR: Granovskiy, V. G.

TITLE: Effect of elastic stresses on the parameters of solid solu-
tions having ferroelectric properties

SOURCE: IVUZ. Fizika, no. 5. 1964, 131-134

TOPIC TAGS: piezoelectric modulus, phase transition, solid solution,
elastic stress, ferroelectric material, polarization

ABSTRACT: The dependence of the piezoelectric moduli and the phase
transition temperature on the composition in the presence of elastic
stresses is investigated for solid solutions having ferroelectric
properties. These investigations are of importance in connection
with a possible practical use of the piezoelectric properties of fer-
roelectric materials. Special attention is paid to piezoelectric
materials whose symmetry admits of a piezoelectric connection between

Card   1/2

L 13082-65
ACCESSION NR: AP4047360

the strains and polarizations along the ferroelectric axis. By ex-
panding the thermodynamic potential in powers of the polarization and
considering only normal stresses, the author shows that the connection
between the strain and the electric field intensity exhibits hystere-
sis behavior. The shift in the temperature of the phase transition
occurring upon application of a stress is taken into account, and
the coefficient for the temperature variation of the stress is evalu-
ated for the case of first and second order phase transitions. It is
concluded that the shift in the temperature of the phase transition,
which can be determined from the calculations presented, must be ta-
ken into account in the investigation of the piezoelectric proper-
ties of solid solutions. Orig. art. has: 15 formulas.

ASSOCIATION: Rostovskiy gosuniversitet (Rostov State University)

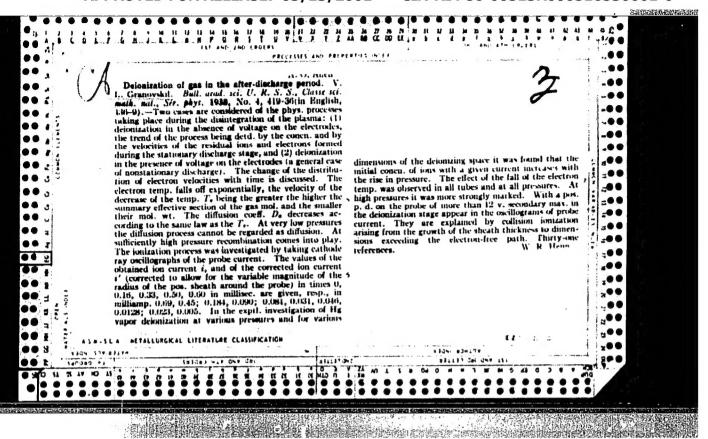SUBMITTED: 25Jun63

CODE: SS   NR REF SOV: 002

ENCL: 00

OTHER: 001

Card 2/2

PROCESSES AND PROPERTIES INDEX

Deionization of gas in the after-discharge period. V. L. Granovskii. *Bull. acad. sci. U. R. S. S., Classe sci. math. nat., Sér. phys.* **1938**, No. 4, 419-36 (in English, 436-9).—Two cases are considered of the phys. processes taking place during the disintegration of the plasma: (1) deionization in the absence of voltage on the electrodes, the trend of the process being detd. by the concn. and by the velocities of the residual ions and electrons formed during the stationary discharge stage, and (2) deionization in the presence of voltage on the electrodes (a general case of nonstationary discharge). The change of the distribution of electron velocities with time is discussed. The electron temp. falls off exponentially, the velocity of the decrease of the temp. T_e being the greater the higher the summary effective section of the gas mol. and the smaller their mol. wt. The diffusion coeff. D_a decreases according to the same law as the T_e. At very low pressures the diffusion process cannot be regarded as diffusion. At sufficiently high pressure recombination comes into play. The ionization process was investigated by taking cathode ray oscillographs of the probe current. The values of the obtained ion current i, and of the corrected ion current i' (corrected to allow for the variable magnitude of the radius of the pos. sheath around the probe) in times 0, 0.16, 0.33, 0.50, 0.60 in millisec. are given, resp., in milliamp. 0.69, 0.45; 0.184, 0.090; 0.061, 0.031, 0.046, 0.0128; 0.023, 0.005. In the exptl. investigation of Hg vapor deionization at various pressures and for various dimensions of the deionizing space it was found that the initial concn. of ions with a given current increases with the rise in pressure. The effect of the fall of the electron temp. was observed in all tubes and at all pressures. At high pressures it was more strongly marked. With a pos. p. d. on the probe of more than 12 v. secondary max. in the deionization stage appear in the oscillograms of probe current. They are explained by collision ionization arising from the growth of the sheath thickness to dimensions exceeding the electron-free path. Thirty-one references.

W. R. Hess

ASM-SLA   METALLURGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

Utilization and detoxication of cupola-furnace gases. I. M. Rafalovich and V. L. Granovskii. Liteinoe Delo, No. 1, 13-18(1938); Chem. Zentr. 1939, II, 559. — The following arrangements were tested both theoretically and practically: (1) regeneration of the gases by the addn. of heat from without or by their own heat in the gasification of coke, (2) mixing of the gases with gaseous fuel of high heating value, (3) burning of the gas with the heat developed being used for recuperation or regeneration of steam, (4) combustion of the gases without utilizing the heat produced and (5) discharge of the gas into the atm. Of these schemes, only (3) is useful under operating conditions. The advantages and disadvantages of using the heat for recuperation are discussed. M. G. Moore

METALLURGICAL LITERATURE CLASSIFICATION

1A

3

PROPERTIES AND PROPERTIES INDEX

Diffusion of ions in a discharge and the initial rate of gas deionization. I. V. L. Granovskii. *(Compt. rend. acad. sci. U. R. S. S. 23*, 883-7(1939)(in English); cf. C. A. 33, 6703[1].—The diffusion theory is used to calc. the ambipolar diffusion coeff. D_a and μ, the root of the equation $n_W/n_0 = J_0(\mu)$, where n_W/n_0 is the ratio of the ion concn. at the wall to that at the axis and J_0 is Bessel's function of zero order. D_a is calcd. for 2 limiting cases (1) direct ionization and (2) cumulative ionization. The theoretical and exptl. values of μ obtained from probe measurements in a Hg vapor discharge tube are found to agree. II *Ibid.* 888-90.—The deionization (time const.) can be calcd. from the relation $\tau = R^2/D_a\mu^2$. On the assumption D_a at the start of deionization has the steady discharge value, the initial value (τ_0) can be calcd. These calcns. are compared with those detd. by probe measurements with a cathode oscillograph. The results are (1) for pR less than 0.2 mm. Hg the calcd. values are in agreement with expt., (2) with tubes of large diam. the best agreement occurs when D_a is calcd. on the basis of accumulative ionization, (3) for smaller tubes the value of τ_0 is intermediate between those calcd. from the 2 assumptions on D_a and (4) in case of pR more than 0.25 cm. Hg, the initial disintegration rate is greater than the calcd. value with either of the assumptions.   Earl A. Gulbransen

All-Union Elec. Eng. Inst, Moscow

A S M - S E A   METALLURGICAL LITERATURE CLASSIFICATION

537.523.94 — 82

Theory of non-stationary states of the electric discharge plasma. GRANOVSKY, B.—J. Phys., USSR, 3, 3, p. 198, 1940.—An essay on the theory of l.f. and

m.f. processes in the plasma of a l.p. discharge; it is a natural generalization of Schottky's diffusion theory on the non-stationary states of the plasma.   E. R. A.

1355

A S R - 1 L A   METALLURGICAL LITERATURE CLASSIFICATION

LU E

On the Theory of the Varying Electric Discharge in Gases.—V. L. Granovsky. (C. R. Acad. Sci. U.R.S.S., 1940, Vol. 28, No. 8, pp. 670 880. In English.) Varying discharge phenomena may be classified into (a) those associated with the electrical inertia of the discharge, (b) those associated with the thermal inertia of the gas and the electrode system. The paper deals with (a), with the following limitations:—1. The plasma is the main part of the discharge. 2. Displacement current small compared with conduction current. 3. Pressure not too low. 4. Plasma quasi-neutral (cf. Schottky's theory of ambipolar diffusion). 5. Maxwellian electron velocity distribution. 6. Energy of the electron gas derived from the electric field and lost by collision with gas molecules. 7. The normal atoms are directly ionized. 8. Tube connected to a source of e.m.f. through a resistance. Formulae are given for the balance of ions, the equation of ionization, the balance of energy in the electron gas, the equation of mobility and the current. See 1125 of May (Granovsky) for a sequel to this paper.

CA

3

PROCESSES AND PROPERTIES INDEX

Applicability of similarity laws to the positive column in mercury discharges. V. I. Granovskii. Compt. rend. acad. sci. U. R. S. S. 28, 37-0(1940)(in English).—Exptl. evidence indicates that for the pos. column in Hg vapor

discharges the similarity laws hold only for low pressures.
I. C. La Cleven

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

General Physics

Small Perturbations of the Electric Discharge.
V. L. Granovsky. (*C.R. Acad. Sci. U.R.S.S.*,
10th July 1940, Vol. 28, No. 1, pp. 19-11. In
English.) Equations were developed in a previous
paper (*C.R. Acad. Sci. U.R.S.S.*, Vol. 26, No. 9,
Granovsky) describing the dynamic states of the
plasma under diffusion conditions. In this paper
conclusions are deduced from them for conditions
of small perturbations. (a) The relations between
the variable components of the discharge para-
meters do not depend on the external circuit.
(b) The passage of a transient is aperiodic for gas
pressures greater than a critical value, and damped
oscillatory for lower pressures. (c) Forced oscilla-
tions (modulated discharge) are considered, and
various semi-quantitative conclusions reached on
the relationship between the modulating e.m.f. and
the current, particle concentration, etc.

WE

537.525 1613

Disintegration of the Plasma of a Low-Pressure Electrical Discharge. — V. L. Granovsky. (*J. Phys.*, U.S.S.R., 1944, Vol. 8, No. 2, pp. 76-83.) An investigation of the deionisation of gas in a discharge tube after the electric field is removed. Expressions are derived theoretically for the rates of decrease of the temperature and concentration of the electrons, which are initially exponential. The decrease of the velocities of the ions is much more rapid than that of the electrons, and the ambipolar diffusion coefficient D_{am} decreases relatively slowly. The effect of fresh ionisation during the process is practically negligible.

The plasma disintegration of Hg vapour in cylindrical tubes of 65 and 105 mm diameter at various pressures from 2.3 to 65 μ Hg was investigated experimentally. A 50-c/s recurrent technique with oscillographic display was used, and the p.d. across a low resistance in the probe circuit was passed to the c.r.o. through a d.c. amplifier. The ionization decreased in the predicted manner, and the time constant τ_0 of the initial process was computed and found to be in good agreement with the value derived from D_{am} in stationary processes. 37 references are given.

517 545 - 535 551-25

Characteristic Electric Oscillations of a Low Pressure Mercury Arc. B. L. Granovsky & I. Bykhovskaya (C. R. Acad. Sci. U.R.S.S., Nov. 1945, Vol. 49, no. 5, pp. 339-342. In English). Short account of experiments on oscillations in the frequency range 10^4–10^8 c/s in a circuit consisting only of a constant e.m.f., ohmic resistance and discharge gap". In these experiments the discharge gap was a mercury arc and the existence of

four different types of oscillation was established: a) irregular deviations of the voltage from its normal value in the case of a freely moving cathode spot, b) irregular oscillations at higher frequencies in the case of an anchored cathode spot, c) regular oscillations in the low r.f. range (10^4–10^8 c/s), and d) regular oscillations in the range of sound frequencies (1000 p/s c/s and lower). See also 2873 below.

μ ℰ

The Generation of High-Power Electric Oscillations by a Low Pressure Discharge.—H. I. Granovsky & J. V. Smetin (*C. R. Acad. Sci. U.R.S.S.*, 1945, Vol. 49, No. 6, pp. 410-413. In English.) Brief summary of results of a study of the generation of oscillations by gas discharge tubes having a perforated diaphragm or a narrow neck dividing the anode from the cathode regions (such tubes are here given the name "stenotrones"). The form of these oscillations depends on temperature, pressure, shape of tube, nature and density of gas discharge, and upon the external circuit. Frequencies of 15-100 kc.s and useful oscillatory powers up to 1 kW were obtained. See also 2871 above.

33

Spontaneous Electrical Oscillations in Low-Pressure Arc Discharge. B. Granovsky and L. Bykhovskaya. *Journal of Physics* (U.S.S.R.), v. 10, no. 4, 1946, p. 351-359. (In English.)

Spontaneous oscillations of current and voltage in a low-pressure mercury arc discharge arising in a circuit, lacking both capacitance and inductance, have been investigated. Four different modes of oscillations are observed, depending upon discharge conditions and especially upon whether the cathode spot is free or anchored. These oscillations may be random or regular, of acoustic or of supersonic frequency. The dependence of the frequency and peak values of these oscillations upon pressure, current magnitude and arc-gap spacing has been investigated. Probable mechanism for generation of the various types of oscillations is discussed. 13 ref.

All-Union Electrotech. Inst.

GTRSPL, Vol. 2, No. 12

Granovski, V.L. and Suetin, T. A., Generation of power electrical oscillations in the low pressure discharge, 1021-30.

Journal of Technical Physics (U.S.S.R.), Vol. 16, XIX (1946)

Translation Available at Brookhaven National Laboratory.

General Physics

N.E.

517.57.5.5   1947

The Generation of Powerful Electric Oscillations in a Low-Pressure Discharge : Part 2 — The Use of Current Interruptions in a Low-Pressure Arc for generating Undamped Electric Oscillations.

V. L. Granovski & T. A. Suetin. (*Zh. tekh. Fiz.*, 1947, Vol. 17, No. 4, pp. 391-398. In Russian.)

An experimental investigation was made of the appearance of oscillations in a low-pressure discharge tube with an abrupt constriction, obtained by the use of a small aperture in a diaphragm made of a dielectric material. Details of experiments and of the tube used are given in part 1 (*ibid.*, 1946, Vol. 16, p. 1051). Experiments have shown that with an aperiodic circuit, not only oscillations of the second type (with periodic interruptions of the current, see last oscillogram in Fig. 1) but also oscillations of the first type (see first oscillogram in Fig. 1) can be obtained. The amplitude, frequency and form of the oscillations of the second type depend on the circuit used and on the conditions of the discharge. A theory of the oscillations is proposed which is confirmed satisfactorily by experiments. It is suggested that periodic interruption of the current in the tube with an abrupt constriction (stenotron) can be used for generating powerful undamped oscillations at ultrasonic frequencies. Examples of oscillation with outputs up to 1 kW and suitable for low-voltage operation are described.

1948

PROCESSES AND PROPERTIES INDEX

537.52

1918. **Investigation of the variation of the intensity of the independent current in a gas.** GALKINA, S. P. AND GRANOVSKII, V. L. *J. Tech. Phys., USSR,* 18, 585-600 (May, 1948) *In Russian.*—Low pressure tests on Hg vapour arc discharges established that increase of current requires a temporary voltage rise, and reduction of current a temporary decrease of the voltage in the discharge path, considered as an unchanging gaseous medium. If the current variation is produced by a rapid (i.e. $< 10^{-7}$ sec) change of the resistance in the discharge circuit, then the temporary rise (or fall) of the voltage presents a sharp peak with steep front and smoother descent. The drop period from the peak value of the voltage, i.e. the time taken for establishing a new equilibrium, $\sim 10^{-7}$ sec, and depends on the gas density; it coincides exactly with the duration of the recovery processes in the discharge, as previously determined by the method of small oscillations. At slow rates of action on the discharge (10^{-3} sec and more) the voltage peak becomes insignificant. The results show that in an unchanging gaseous medium, as in any other medium, the voltage variation in the discharge path is the primary cause of the current variation along it.

B. F. K.

All-Union Elec. Eng. Inst. Moscow

GRANOVSKIY, V. L.   (Prof.)

   "Physical Phenomena in a Low-Voltage Mercury-Arc Rectifier." reported in the article "First All-Union Scientific and Technical Session on Mercury-Arc Rectifiers,"   Elektrichestvo No. 11, 1949.

Abstract   W-9395, 10 Apr 1950.

5a.
Section A

Heat

536,423

8119. Data of evaporation of a liquid at different temperatures of evaporator and condenser. V. L. _____, _____ Tekh. Fiz., 21, 1088-13 (No. 9, 1951) In Russian.

The problem is examined in the case of a vessel the sides of which are at a much lower temperature than the surface of the liquid. Regional conditions are calculated from the partial reflection of the molecules and the variation of the distribution of speed of the latter from the Maxwellian. The density, temperature and pressure of vapour are shown to remain practically constant throughout the volume of the vessel. Expressions are deduced which determine the above quantities, as well as the speed of evaporation of a liquid in the cases of either a plane or spherical configuration of the vessel employed. See also preceding abstract.   J. CLEUGH

GRANOVSKIY, V. L.

USSR/Physics - Plasma

Jan 52

"Theory of Plasma in Rarefied Gas in the Case of Varying Current Strength," V. L. Granovskiy, All-Union Elec-Tech Inst

"Zhur Eksper i Teoret Fiz" Vol XXII, No 1, pp 3-10

Applies the general eqs of comparatively slow non-stationary processes in plasma (during which processes the regime of ambipolar diffusion is preserved) to the computation of the concn of electrons and ions in the case where the strength of the independent current in the gas varies. Considers the problem concerning the partial deioni-zation of gas for decreasing current strength, and

204T100

USSR/Physics - Plasma (Contd)

Jan 52

calculates the residual concn of electrons and ions after complete cessation of the independent current. Submitted 10 Mar 51.

204T100

GRANOVSKIY, V. L.

PA 244T101

USSR/Physics - Ionic Converters   Mar 52

"The Theory of Voltage Distribution in a Sectional-
ized Ionic Converter," V. L. Granovskiy, All-Union
Elec Eng Inst iment V. I. Lenin

"Zhur Tekh Fiz" Vol 22, No 3, pp 408-414

States that the actual voltage distribution in the
discharge space of a sectionalized ionic converter
in the non-conducting part of the cycle begins after
the positive space charge layers surrounding each
electrode drift together. Considers the first stage
of the process before the layers drift together,

244T101

which determines the potential distribution on the
electrodes themselves. Submitted 8 Oct 51.

244T101

USSR/Physics - Electric arc   FD-1862

Card 1/1   Pub. 146-22/25

Author   : Granovskiy, V. L., and Timofeyeva, G. G.

Title   : Compression and bending of an arc in rarefied gas during great current
                 strength

Periodical   : Zhur. eksp. i teor. fiz. 28, 378, March 1955

Abstract   : The authors experimented on arcs in rarefied vapors of mercury and inert
                 gases in straight cylindrical tubes without constrictions at constant
                 current direction. Measurements with a mobile probe in a tube with diam-
                 eter 70 mm and Hg vapors at pressure 1 micron/Hg confirmed that at increase
                 of current from 1 to 80 amperes the width of the column decreases by about
                 25%. A detailed description of these experiments is planned. Five refer-
                 ences.

Institution: All-Union Electrotechnical Institute [All-Union Electrical Engineering Inst]

Submitted   : November 30, 1954

GRANOVSKIY, V.L.

GRANOVSKIY, V,L.

Category : USSR/Electronics - Gas Discharge and Gas-discharge Instruments   H-7

Abs Jour : Ref Zhur - Fizika, No 2, 1957, No 4358

Author   : Rozanova, N.B., Granovskiy, V.L.
Title   : On the Occurrence of Electric Breakdown in a High Vacuum Gap.

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 3, 489-496

Abstract : A study was made of vacuum gaps up to 5 mm long both under static
           as well as under pulse voltages. On the basis of experimental data,
           the authors conclude that in the case of a high-vacuum gap: 1) the
           breakdown voltage increases with the mechanical strength of the anode
           material; 2) the x-rays are a factor accompanying the breakdown rather
           than causing it; 3) the breakdown voltage of the gap depends on the
           anode material and increases in the following order: C (graphite), Al,
           Cu, (Fe, Ni), Mo, W. It is established that the connection between
           the breakdown voltage and the length of the gap obeys a power law in
           the form $U_{gap} = kd^{\alpha}$, where α is close to 1/2. The experimental data
           can be explained by means of the Krenberg hypothesis, if one assumes
           in addition that the pieces of the material of the electrodes break
           away under the influence of the electric field in the higher-voltage
           regions. Bibliography, 19 titles.
Card   : 1/1

GRANOVSKIY, V.L.

Category : USSR/Electronics - Gas Discharge and Gas-discharge Instruments   H-7

Abs Jour : Ref Zhur - Fizika, No 2, 1957, No 4335

Author   : Timofeyeva, G.G., Granovskiy, V.L.
Inst   : All-Union Electrotechnical Institute
Title   : Deformation of the Column of the Arc in a Rarefied Gas at Large Current

Orig Pub : Zh. eksperim. i teor. fiziki, 1956, 30, No 3, 475-487

Abstract : Arcs were investigated in mercury, hydrogen, argon, and krypton at
           pressures of approximately 10^{-4} -- 10^{-3} mm mercury and at currents
           i_a up to 200 amp. It was found that the half-width of the arc column
           in a tube with a radius $I = 30$ -- 35 mm at p ~1 micron mercury
           (mercury vapor) diminishes by 30% as the current grows to 170 amp.
           It was impossible to detect a further compression of the arc by in-
           creasing the current to 2,000 amp. owing to the occurrence of strong
           oscillations of the probe current, arc voltage, and arc current.
           The amplitude of the oscillations increases with increasing i_a and
           diminishes with p. The frequency of these oscillations is 10^4 -- 10^5
           cycles, increasing with i_a and diminishing with increasing R and with
           increasing molecular weight of the gas. The oscillations result from

Card   : 1/2

Category : USSR/Electronics - Gas Discharge and Gas-discharge Instruments   H-7

Abs Jour : Ref Zhur - Fizika, No 2, 1957, No 4335

the disordered displacement of the string of the arc over the section of the tube. A compressed arc column was observed visually and photographed at short current pulses $i_a \sim 500$ -- 2,000 amp (during which the arc did not have time to shift, $\tau_a \sim 10^{-6}$ sec). The column of the arc compresses into a narrow string bent approximately in a helix that adheres to the walls of the tube. The compression of the column into a narrow string and its flexure into a helix are attributed to the electrodynamic action of the arcs own magnetic field, and its displacement is attributed to gas-dynamic action (local rarefaction of the gas in the channel of the arc). Bibliography, 23 titles.

Card   : 2/2

GRANOVSKIY, V. L.

"Breakdown of High Vacuum Gaps."

paper presented at Second All-Union Conference on Gaseous Electronics, Moscow, 2-6 Oct '58,

FOTIN, V.P.; AKOPYAN, A.A.,red.; ANDRIANOV, K.A.,red.; BIRYUKOV, V.G.,glavnyy
red.; BUTKEVICH, Yu.V.,zamestitel' glavnogo red.; GRANOVSKIY, V.L.,
red.; KALITVYANSKIY, V.I.,red.; KLYARFEL'D, B.N.,red.; KRAPIVIN, V.K.,
red.; TIMOFEYEV, P.V.,red.; FASTOVSKIY, V.G.,red.; TSEYROV, Ye.M.,
red.; SHEMAYEV, A.M.,red.; DEMKOV, Ye.D.,red.; FRIDKIN, A.M.,tekhn.
red.

[Voltage increase on long a.c. lines during nonsymmetric short
circuits to ground] Povysheniia napriazhenii v dlinnykh liniiakh
perennogo toka pri nesimmetrichnykh korotkikh zamykaniiakh na
zemliu. Moskva, Gos.energ.izd-vo, 1958. 223 p. (Moscow. Vsesoiuznyi
elektrotekhnicheskii institut. Trudy, no.64)   (MIRA 12:2)
                    (Electric lines)   (Short circuits)

57-28-5-33/36

AUTHORS: Granovskiy, V. L., Rozanova, N. B.,
             Moiseyeva, I. S.

TITLE: Flashover Along the Surface of a Dielectric During the
             Passage of Current on Its Opposite Side
             (Perekrytiye vdol' poverkhnosti dielektrika pri pro-
             khozhdenii toka s drugoy storony yego)

ABSTRACT: The authors determined and measured a considerable re-
             duction of the flashover voltage along the surface of a
             solid dielectric bordering on the gas. It can be assumed,
             that the reduction of the voltage (Figures 4 and 5) is
             caused by a distortion of the field because of the con-
             ductivity near the dielectric. Another cause for the re-
             duction of U_{fl} could be represented by a short-term in-
             crease of the resulting voltage, which acts on the inve-
             stigated domain because of the formation of a turbulence
             field at the passage of a strong current with a short
             rise time. Corresponding experiments are described in an

Card 1/3

Flashover Along the Surface of a Dielectric During   57-28-5-33/36
the Passage of Current on Its Opposite Side

other article. If even a weak spontaneous current is
generated in the non-conducting medium adjacent to the
dielectric actually a plasma is produced - a medium with
a considerable conductivity. In the pressure range
$(1 \cdot 10^{-3} \quad 2 \cdot 10^2$ mm of mercury column), where low U_{fl}

were observed, an electrodeless current is generated on
the opposite side, if an alternating high voltage is
applied to the dielectric. It becomes manifest in a more
or less intensive luminosity of the gas. The conductivity
produced in this process in the medium adjacent to the
dielectric apparently effects the reduction of U_{fl}. At a

pressure below $1 \cdot 10^{-4}$ and above $2 \cdot 10^2$ mm of mercury
column an electrodeless current also exists. It is, how-
ever, very small, as an impact ionization is little pro-
bable. As can be seen from figures 1o and 11, a conductor
(metal) brought in the vicinity of the dielectric, also
modifies the flashover voltage on its opposite side. In
this instance, the magnitude of the variation of U_{fl} is

Card 2/3   immediately connected with the potential of this conductor.

Flashover Along the Surface of a Dielectric During   57-28-5-33/36
the Passage of Current on Its Opposite Side

It reaches its maximum, when the distortion of the field
caused by the conductor at the external electrodes is
greatest. The distortion of the field at a variation of
the boundary conditions at the inner face of the isolator,
because of the generation of conductivity, can be estima-
ted numerically. As, unfortunately, no more or less com-
plete quantum theory of dielectric flashover exists, it is
impossible at present to combine a redistribution of the
field near the cathodes with a reduction of U_{fl} in a quan-
titative way. The authors thank M. K. Bologa, V. I. Sa-
voskin and N. A. Sivozdrav for their collaboration, and
V. I. Zhevoruyeva for the computations for (Figure 13).
There are 13 figures, 1 table and 2 Soviet references.

SOV/56-35-1-5/59

AUTHORS: Granovskiy, V. L., Ryumina, K. P., Savoskin, V. I., Timofeyeva, G. G.

TITLE: Observations of the Pinch Effect During a Decrease of Amperage (Nablyudeniya pinch-effekta pri umen'shayushcheysya sile toka)

ABSTRACT: The influence of the plasma's own magnetic field upon the plasma column has already been investigated by various authors (Refs 1-5); in some cases this was done in the case of increasing amperage (e.g.Ref 4). In the present paper the authors describe investigations of plasma deformations in the case of decreasing amperage in discharge tubes of 10 and 32 mm diameter in hydrogen- or mercury vapor at from 10^{-3} to 10^{-2} torr, at current pulses of ~ 300 microseconds and amplitudes of from 1,3 to 5,5 kA ($300\mu F$, 1-3 kV). For photorecording an electron-optical trans- former (type PIM-3, developed by M.M.Butlerov) was used. Photographs are given of a number of contracted, bent, or

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Observations of the Pinch Effect During a Decrease of   SOV/56-35-1-5/59
Amperage

kinked plasma filaments. I_t was found that for $di/dt < 0$
such electrodynamic deformations occur, which vanish
again at points of high gas density (i.e.according to
experimental conditions near the cathode or near the
anode). Exposure in each case lasted 1,5 microseconds.
There are 3 figures, 1 table, and 6 references, 2 of
which are Soviet.

ASSOCIATION: Vsesoyuznyy elektrotekhnicheskiy institut (All-Union
Institute of Electrical Engineering)

SUBMITTED: February 12, 1958

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· 10(4)
AUTHORS:

Glotova, G. I., Granovskiy, V. L., Savoskin, V. I.

TITLE:

A Comparison of the Decay Rates of the Plasma in Hydrogen and Deuterium (Sravneniye skorostey raspada plazmy v vodorode i deyterii)

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 6, pp 1380-1385 (USSR)

ABSTRACT:

Decay rates and deionization depend on the properties of the gas molecules (as e.g. on the effective cross section, on mass, ionization potential, and excitation). The following are the aims of the present paper: 1) Comparison between the deionization rates of the hydrogen isotopes H and D, and 2) a comparison of these ratios with those of the atomic weights of these gases. The methods employed as well as the apparatus used (for wiring circuit see figure 1) are described in short (see also references 1-5). Measurements were carried out at pressures of 0.015 - 0.6 torr and with tube diameters of d=3.2 - 6.5 cm, and at values of the preceding current amounting to $I_o = 60 - 1500$ mA, by the method of the oscillography of the ion current recorded with a negative probe. Under these experimental conditions, the relative deionization rate in H and D decreased with time. The pressure dependence of the velocity

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A Comparison of the Decay Rates of the Plasma in Hydrogen and Deuterium

of the process does not develop monotonously but passes through a maximum at pd $\sim 10^{-1}$ - 1 torr cm. For the so-called deionization "time constants" τ_D and τ_H it holds that: $\tau_D/\tau_H = 1.41$,

$$\tau_D/\tau_H = (A_D/A_H)^{\frac{1}{2}} = (m_D/m_H)^{\frac{1}{2}} = \sqrt{2};$$ (A = atomic weight). This holds for all pressures both under diffusion conditions ($p < p_m$, i.e. $pd \leq 10^{-1}$ torr) and under recombination conditions ($p > p_m$, i.e. $pd \geq 1$ torr). Under recombination conditions the following elementary recombination processes are possible:

1) $M^+ + e \rightarrow M + h\nu$ (emission)
2) $M^+ + 2e \rightarrow M + e$ (double collision)
3) $M^+ + e + M \rightarrow 2M$ (treble collision)
4) $e + M \rightarrow M^-$; $M^- + M^+ \rightarrow 2M$ (electron capture by neutral molecule followed by ion recombination) and
5) $M_2 + e \rightarrow M^* + M$ (dissociative recombination).

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SOV/56-35-6-9/44

A comparison of the Decay Rates of the Plasma in Hydrogen and Deuterium

A discussion of these possibilities shows that mainly case 3) is of importance for recombination.-There are 4 figures and 12 references, 3 of which are Soviet.

ASSOCIATION: Vsesoyuznyy elektrotekhnicheskiy institut, g.Moskva (All-Union Electrotechnical Institute, City of Moscow)

SUBMITTED: June 24, 1958

Card 3/3

GRANOVSKIY, V. L.

21(7)   PHASE I BOOK EXPLOITATION   SOV/1829

Granovskiy, Veniamin L'vovich

Veshchestvo v sostoyanii plazmy (Matter in the Plasma State) Moscow,
    Izd-vo "Znaniye", 1959. 28 p. (Series: Vsesoyuznoye obshchestvo po
    rasprostraneniyu politicheskikh i nauchnykh znaniy. Seriya IX, 1959,
    Nr 3) 36,500 copies printed.

Sponsoring Agency: Vsesoyuznoye obshchestvo po rasprostraneniyu politicheskikh
    i nauchnykh znaniy.

Ed.: I.B. Faynboym; Tech. Ed.: Ye.V. Savchenko.

PURPOSE: This booklet is intended for the general reader interested in recent
    developments in nuclear physics.

COVERAGE: The booklet gives a brief review of developments in plasma physics in
    the USSR. The principles involved are described in a popular style so that
    readers without a background in science may understand them. The behavior of
    matter at high temperatures and the changes that occur in it are briefly

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Matter in the Plasma State

described. The author then explains the concept of plasma, its properties, and possible fields of application. One property of plasma that is of great interest to scientists is its behavior in a magnetic field. Theoretically a magnetic field could be used to contain and compress plasma, heating it to very high temperatures and initiating a self-sustaining thermonuclear fusion reaction. Some of the large Soviet experimental setups such as "Alfa" and "Ogra" are briefly described. Soviet scientists mentioned who have worked on the plasma project are I.V. Kurchatov, L.A. Artsimovich, A.D. Sakharov, I.Ye. Tamm, M.A. Leontovich and G.G. Timofeyeva. There are no references.

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Compression of Plasma by Its Own Magnetic Field   23

Possibility of Obtaining Ultrahigh Temperatures in Plasma   25

AVAILABLE: Library of Congress

BK/fal
8-6-59

Card 3/3

SOKOLOV, Nikolay Nikolayevich; ANDRIANOV, K.A.,red.; AKOPYAN, A.A.,red.;
    BIRYUKOV, V.G.,glavnyy red.; BUTKEVICH, G.V.,red.; GRANOVSKIY, V.L.red.;
    GERTSENBERG, G.R.,red.; ZABYRINA, K.I.,red.; KALITVIANSKIY, V.I.,red.;
    KLYARFEL'D, B.N.; SAKOVICH, A.A.; TIMOFEYEV, P.V.; FASTOVSKIY, V.G.;
    TSEYROV, Ye.M.; FRIDMAN, A.Ya.; SHEMAYEV, A.M.; TIMOKHINA, V.I.,red.

[Methods for the synthesis of organopolysiloxanes] Metody
sinteze poliorganosiloksanov. Moskva, Gos.energ. izd-vo. 1959.
198 p. (Moscow. Vsesoiuznyi elektrotekhnicheskii institut.
Trudy, no.66)   (MIRA 12:5)
                        (Siloxanes)

66702

24,2/20

SOV/109-4-8-22/35

AUTHORS: Granovskiy, V.L., Luk'yanov, S.Yu., Spivak, G.V. and
             Sirotenko, I.G.

TITLE: Report on the Second All-Union Conference on Gas
             Electronics

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 8,
             pp 1339 - 1358 (USSR)

ABSTRACT: The conferences was organised by the Ac.Sc.USSR, the
             Ministry of Higher Education and Moscow State University.
             It was opened by the chairman of the organising committee,
             M.A. Leontovich, Academician. During the plenary sessions
             of the conference, a number of survey papers were delivered.
             L.A. Artsimovich read a paper on "Production of Ultra-high
             Temperatures in Plasma".
             A survey of the optical method of measurements was given
             in the papers by V.A. Fabrikant and S.E. Frish.
             S. Brown of the Massachusetts Institute of Technology
             gave a survey of the high-frequency methods of the investi-
             gation of stationary and non-stationary plasma (see p 1244
             in this issue of the journal).
             N.V. Fedorenko read a paper entitled "Ionisation and
Card1/15   Inelastic Scattering During Atomic Collisions".

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SOV/109-4-8-22/35

Report on the Second All-Union Conference on Gas Electronics

L.A. Sena and Yu.M. Kagan deal with "Elementary Processes of Determining the Motion of Ions in Gas". A paper by Ye. Bedereu (Rumania) dealt with "The Role of Resonance--recharging in the Kinetics of Ions". I.S. Stekol'nikov considered the initial stages of the development of sparks (corona-leader, main channel and the final channel). B.N. Klyarfel'd gave a survey of the ignition processes of the discharges in highly rarified gases. The mechanism of the breakdown of a high-vacuum gap was elucidated in a paper by V.L. Granovskiy. L. Tonks (USA) expounded a theory of the motion of electrons in a magnetic trap (see p 1316 of this journal). Academician R. Rompe (Eastern Germany) described a number of experiments on non-stationary plasma conducted by himself. M. Stenbeck (Eastern Germany) gave a generalised theory of plasma. The conference was divided into six sections. The first section was presided over by L.A. Sena and was

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Report on the Second All-Union Conference on Gas Electronics

concerned with the elementary processes in gas discharges.
The following papers were read in this section:
Ya.M. Fogel'- "Transformation of Positive Ions Into
Negative Ones in Rarified Gases".
Ya. M. Fogel' with V.A. Ankudinov and D.V. Pilipenko -
"Capture and Loss of Electrons During the Collision of
Fast Atoms of Carbon and Hydrogen with the Molecules of
Gases".
N.V. Fedorenko et al. - "Dissociation of Molecular Ions
of Hydrogen During Collisions in Gas".
I.P. Flaks and Ye.S. Solov'yev - "Capture   Cross-sections
of Electrons in Multicharge Ions in Inert Gases".
R.M. Kushnir et al. - "Experimental Investigation of the
Resonance Recharging in Certain Single-atom Gases and
Metal Vapours".
O.B. Firsov - "Qualitative Investigation of Inelastic
Collisions of Atoms".
L.M. Volkova - "Effective Excitation Cross-sections of the
Spectral Lines of Potassium and Argon".
Card3/15 I.P. Zapesoshnyy and S.M. Kishko "Some Results of the

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Report on the Second All-Union Conference on Gas Electronics

Investigation of the Optical Functions of the Excitation Bands of a Negative System".

A.A. Vorob'yev and A.G. Vlasov - "Investigation of the Scattering of the Electrons in a Betatron Chamber".

The second section was presided over by B.N. Klyarfel'd and was devoted to the problems of the electrical breakdown in rarified gases and in high vacuum. The following papers were read in this section:

G.Ye. Makar-Limanov and Yu.A. Metlitskiy - "Electrostatic Control of the Ignition of Glow-discharge Tubes"(see p 1274 of the journal).

S.V. Ptitsyn et al. were concerned with the breakdown in a high-voltage mercury rectifier (see p 1278 of the journal).

L.G. Guseva "Ignition of the Discharge in Non-uniform Fields at low Gas Pressures" (see p 1260 of the journal).

A.S. Soboleva and B.N. Klyarfel'd - "The Discharge Phenomena Between a Point and a Plane at Gas Pressures of

10^{-3} - 1 mm Hg".

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T.B. Fogel'son - "Methods of Reducing the Energy Lost in the Formation of a Breakdown".

L.I. Pivovar and V.I. Gordiyenko - "Microdischarges and pre-breakdown Currents Between Metal Electrodes in High Vacuum".

V.A. Simonov and G.P. Katukov - "Investigation of the Processes of Initiation and Development of a High-voltage Discharge in Vacuum".

E.M. Reykhrudel and G.V. Smirnitskaya - "The Character-istics of Ignition in High-vacuum in Magnetic Fields".

L.V. Tarasov et al. dealt with the transfer of the electrode material during the pre-breakdown stage in vacuum.

N.B. Rozanov et al. - "The Motion of Micro-particles of Substances During Electric Breakdown in Vacuum".

The third section dealt with the problems of electric sparks, corona and the practical applications. It was presided over by I.S. Stekol'nikov. The following papers were read:

V.I. Levitov et al. - "Probe Investigation of the a.c. Corona Fields".

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G.N. Aleksandrov - "Elementary Processes in the Ionisation Zone of Corona-type Conductors at Atmospheric Pressures".

V.A. Burmakin - "Appearance of a Corona Discharge in Hydrogen and Nitrogen"

P.N. Chistyakov et al. - "Some Properties of the Corona Discharge in Hydrogen in/Coaxial, Cylindrical System".

A.S. Soboleva and B.N. Klyarfel'd - "Appearance of Discharge Phenomena Between a Point and a Plane at Gas Pressures of $10^{-3} - 1.0$ mm Hg".

Ya.Yu. Reynet et al. - "Methods of Unipolar Ionisation of Air By Means of Aero-ionisers (see p 1335 of the journal).

M.P. Vanyukov et al. - "Time Spectra of the Radiation of a Spark Discharge in Inert Gases" (see p 1284 of the journal).

M.P. Vanyukov and A.A. Mak - "Production of High Temperatures by Means of Spark Discharges".

V.A. Peretyagin - "Influence of the Magnetic Field of the Electric Discharge on the Dividing Surface of Two Media".

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Report on the Second All-Union Conference on Gas Electronics

I.S. Stekol'nikov - "New Data From the Study of Long Sparks".

M.I. Sysoyev - "Properties of the Breakdown of Compressed Air in a Comparatively Uniform Field in the Presence of Localised Non-uniformities".

A.A. Vorob'yev et al. - "Pulse and Oscillographic Techniques for the Measurement of the Discharge Lags in Dielectrics" (see p 1257 of the journal).

A paper by B.N. Zolotykh dealt with the problem of the basic theory of the electric erosion (see p 1330 of the journal).

The fourth section was presided over by S.Yu. Luk'yanov and was concerned with the non-stationary and low-frequency discharges. The following papers were read:

I.G. Nekrashevich and A.A. Labud - "The Nature of the Current Interruption During the Electric Explosion of a Metal Wire".

V.A. Simonov - "Propagation of Plasma From Local Pulse Sources".

G.G. Timofeyev et al. - "Observation of an Electro-dynamically Compressed Arc By Means of an Electron-optical

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Converter".
M.S. Ioffe and Ye.Ye. Yushmanov - "Investigation of
the Radial Electric Field in an Ion Magnetron".
V.A. Belyayev and M.K. Romanovskiy - "Experiments with an
Electron Model of a System with Magnetic Samples".
A.M. Andrianov et al. "Distribution of Magnetic and Electric
Fields in Powerful Pulse Discharges".
G.N. Harding (England) - "Spectroscopic Determination
of the Plasma Temperature in the "Zeta" Equipment"
(see p 1326 of the journal).
The paper by Harding aroused a lot of interest and
Academician L.A. Artsimovich expressed the opinion that
the electrons and ion temperatures in the "Zeta" should
be of the same order; instead, according to Harding,
the electron temperature is lower by an order than that
of the ions.
A paper by S.Yu. Luk'yanova and V.I. Sinitsyn was devoted
to the problem of spectroscopic investigation of heated
plasma.

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I.M. Podgornyy and N.G. Koval'skiy - "New Data on X-ray Radiation During Pulse Discharges"
V.A. Khrabrov and M.M. Sulkovskaya dealt with the investigation of the neutron radiation in powerful gas discharges in chambers with conducting walls.
N.A. Borzunov et al. - "Investigation of the Gas Discharge in a Conical Chamber".
S.M. Osovets et al. - "A Turn of Plasma in Transverse Magnetic Field".
I.G. Kesayev "Data on the Division of a Cathode Spot on Mercury in a Low-pressure Arc" (see p 1289 of the journal).
A.E. Robson (England) - "A New Theory of the Cathode Spot" (see p 1295 of the journal).
L.N. Breusova - "Positive Column in a Hydrogen Discharge With Stationary and Pulse Loads".
I.G. Nekrashevich and A.A. Labud - "Current Distribution on the Surface of Electrodes in Electric Pulse Discharges".
L.S. Byg - "Some Properties of Gas Discharges in Low-voltage in Halogen Counters".

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SOV/109-4-8-22/35

Report on the Second All-Union Conference on Gas Electronics

G.I. Glotova and V.L. Granovskiy - "Comparison of the Initial De-ionisation in the Isotopes of Hydrogen (H and D)".
L.A. Akol'zina communicated some results on the pre-breakdown current pulses at low pressures.
M.Ya. Vasil'yeva and A.A. Zaytsev - "Charge-density oscillation Waves in Cylindrical Plasma".
L. Pekárek of Czechoslovakia communicated some information on the wave-like phenomena in gas-discharge plasma.
B.G. Brezhnev dealt with the problem of the determination of the energy of fast ions in pulse discharges.
B.B. Kadomtsev - "Convection Instability of a Plasma String".
S.I. Braginskiy and V.D. Shafranov - "Theory of a High-temperature Plasma String".
The fifth section was presided over by N.A. Kaptsov and dealt with high-frequency currents in gases. The following papers were read:
V.Ye. Golant - "Formation of Ultra-high Frequency Pulse Discharges in Inert Gases".

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SOV/109-4-8-22/35

Report on the Second All-Union Conference on Gas Electronics

N.A. Neretina and B.N. Klyarfel'd - "Formation of Light Spots on the Anode of a Gas Discharge (see p 1301 of the journal).

N.A. Matveyeva -"Distribution of Binary Mixtures of Inert Gases in a d.c. Discharge".

V.G. Stepanov and V.F. Zakharchenko - "Some Phenomena in Rarified Plasma".

V.G. Stepanov and V.S. Bezel' - "The Possibility of Obtaining Highly Concentrated Plasmas".

G.V. Smirnitskaya and E.M. Reykhrudel' - "Some Character- istics of the Discharge in an Ion Pump and in a Magnetic Ionisation Vacuum Gauge".

Ye.T. Kucherenko and O.K. Nazarenko - "Properties of a Discharge with Electron Oscillations in a Magnetic Field" (see p 1253 of the journal).

The paper by L.M. Biberman and B.A. Veklenko considered the approximate methods for determining the concentration of atoms at the radiation levels.

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9,3150

S/109/60/005/07/012/024
E140/E163

AUTHORS: Syrgiy, A.S., and Granovskiy, V.L.

TITLE: On the Theory of Deionisation of a Rarefied Gas in a Magnetic Field

PERIODICAL: Radiotekhnika i elektronika, Vol 5, No 7, 1960, pp 1129-1134 (USSR)

ABSTRACT: The theory of deionisation of a rarefied gas in a cylindrical container in an homogeneous magnetic field parallel to the axis is developed. It is assumed that the gas is a plasma, the gas density and temperature are everywhere the same, the gas density corresponds to the diffusion regime, the mean free paths of electrons and ions are substantially less than the cylinder dimensions, the charger carriers are electrons and positive ions of a single type, no external electric field is applied, fresh ionisation does not occur, charge recombination occurs both at the walls of the container and in the gas volume, the diffusion and recombination coefficients are constant during the process (this is strictly applicable only at later stages of the process when the plasma becomes isothermal or at the very lowest pressures), the magnetic field has no appreciable influence

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S/109/60/005/07/012/024
E140/E163

On the Theory of Deionisation of a Rarefied Gas in a Magnetic
Field

on the recombination coefficient (probably valid for not too
intense magnetic fields and at all pressures at which each
recombination act is elementary; it ceases to be valid for very
high B and in compressed gases where the Langevin theory is
applicable), but the diffusion factor perpendicular to the
magnetic field decreases with increase of magnetic induction B.
The problem is solved by a method similar to that given in Ref 3.
Good agreement is obtained between the calculated values and
those experimentally obtained in the authors' previous work
(Ref 6).
There are 3 figures, 1 table and 6 references, of which 3 are
English and 3 Soviet.

ASSOCIATION: Fizicheskiy fakul'tet, Moskovskogo gosudarstvennogo
universiteta im. M.V. Lomonosova, Kafedra elektroniki
(Chair of Electronics, Physics Department, Moscow
State University imeni M.V. Lomonosov)

Card 2/2

SUBMITTED: December 23, 1959

83271
S/109/60/000/018/026
E140/E455

26.1410
24.2120

AUTHORS: Vasil'yeva, I.A., Granovskiy, V.L. and
Chernovolenko, A.F.

TITLE: New Data on the Influence of Magnetic Fields on the
Ion Loss from Helium and Argon Plasmas

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol.5, No.9,
pp.1508-1515

TEXT: Previous work (Ref.10) concerned a stationary plasma in a
straight cylindrical tube with dielectric walls (side and end) with
helium at t = 0.03 to 1.1 mm Hg.   The radial loss of electrons
and ions in a homogeneous longitudinal magnetic field at currents
less than 0.1 A was found to take place through ambipolar
diffusion.   In the range of magnetic fields up to B ≈ 1300 g
the transverse loss coefficient was given approximately by the
Townsend formula (Ref.1,2).   Two hypotheses have been advanced
concerning the deviation from the Townsend formula observed in
Ref.10 and in other works (Ref.3 to 7):   1. It is connected with
the appearance of non-stationary processes in the plasma, for
example local oscillations of turbulence.   2. It is caused by a
"short circuit" of the plasma by sections of metal tubes walls

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S/109/60/005/009/018/026
E140/E455

New Data on the Influence of Magnetic Fields on the Ion Loss from
Helium and Argon Plasmas

perpendicular to the magnetic flux lines (Ref.8).   The present
work is a continuation of Ref.10, and a special experiment was
carried out to check Simon's hypothesis (Ref.8).   It was found
that if the magnetic field did not act on the cathode region, the
decrease of ion current from the centre to the wall of the tube and
the ion loss coefficient with increase of magnetic field are
monotonic.   If the magnetic field acts on the cathode region,
this relationship is valid only at currents less than 0.1 A.
There is a close relationship between increase of noise and the
formation of "anomalies" in the loss of ions at the tube walls.
Variations of magnetic field change not only the amplitude but the
spectrum of the noise.   Not all oscillation arising in plasma can
facilitate loss of ions to the side walls in the magnetic field.
Moving stria, for example, have no influence.   The types of
oscillations leading to anomalies, the field distribution in them
and their mechanism of affecting ion loss are open questions.   The
present results differ from Lehnert's in that maxima in the curves
of longitudinal electric field vs. magnetic field have been obtained.
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26.1410

S/109/60/005/009/020/026
E140/E455

AUTHORS: Syrgiy, A.S. and Granovskiy, V.L.

TITLE: Rate of Deionization in Rarefied Helium in a
Magnetic Field. Pt.II

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol.5, No.9,
pp.1522-1530

TEXT: By measuring the total ion current at the wall and the
initial number of charged particles in a volume of plasma, the
relative roles of two processes; diffusion and volume
recombination, on the deionization of a rarefied helium in magnetic
field were investigated.   At magnetic fields 0 to 1500 Gauss,
gas pressure of 10^{-2} to 10^{-1} mm Hg and carrier concentrations
greater than 10^{11} cm^3 in a strong magnetic field, volume
recombination predominates.   There are 9 figures, 1 table and
6 references: 4 Soviet and 2 English.

ASSOCIATION: Fizicheskiy fakul'tet Moskovskogo gosudarstvennogo
universiteta im. M.V.Lomonosova, Kafedra elektroniki
(Physics Faculty, Moscow State University
im. M.V.Lomonosov, Chair of Electronics)

SUBMITTED: January 18, 1960
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22910

S/109/61/006/004/025/025
E032/E314

26.2340
26.1632

AUTHORS: Aleskovskiy, Yu.M., Granovskiy, V.L. and
Mikhalets, Ye.

TITLE: Recombinational Emission of a Caesium Plasma in
a Magnetic Field

PERIODICAL: Radiotekhnika i elektronika, 1961, Vol. 6,
No. 4, pp. 674 - 675

TEXT: When a longitudinal magnetic field is applied to the
positive column of a low-pressure discharge, it reduces the
diffusion of electrons and ions towards the walls in the
direction perpendicular to the field. As a result, the mean
lifetime of current carriers in the plasma is increased.
The ion balance is maintained at a lower ionisation frequency
and hence in a stationary plasma the longitudinal electric
field and the electron temperature are reduced. This can be
confirmed experimentally (Ref. 2). In this connection, it
may be supposed that the fraction of charged particles
disappearing from the plasma as a result of volume
recombination should increase in the magnetic field
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S/109/61/006/004/025/025

Recombinational Emission E032/E314

(I.A. Vasil'yeva - Ref. 3). The absolute number of recombinations should also increase somewhat. However, spectroscopic observations of the recombinational emission reported by Davies (Ref. 5) are not in agreement with the above ideas. The present authors have investigated the effect of a magnetic field on the electron recombination in a stationary discharge in low-pressure caesium vapour. The intensity of the recombinational continuum with the limit at 4943 $\mathring{A}$, corresponding to the capture of electrons to the level $Cs6P_{1/2}$ (Ref. 6), was measured. The discharge tube was 25 mm in diameter and was located in a uniform magnetic field produced by two solenoids. The radiation was examined through a gap between the solenoids. The discharge current was varied between 1 and 2.5 A and the caesium vapour pressure between 2 and 130 μ. It was found that the emission of the positive column was very dependent on the magnetic field. The intensities of all the emission lines

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S/109/61/006/004/025/025
Recombinational Emission E032/E314

of caesium decreased with increasing magnetic field. On
the other hand, the recombinational emission increased with
the magnetic field and this was particularly well defined
at low pressures. The figure shows the intensity of
recombinational emission as a function of the magnetic field
at different caesium vapour pressures. The numbers 1, 2,
3, and 4 refer to pressures of 8.2, 18, 36 and 74 μ, respectively
There are 1 figure and 6 references: 2 Soviet and
4 non-Soviet.

ASSOCIATION: Fizicheskiy fakul'tet Moskovskogo
               gosudarstvennogo universiteta im. M.V. Lomonosova
               (Physics Department of Moscow State University
               im. M.V. Lomonosov)

SUBMITTED: January 5, 1961

Card 3/4

28535
S/109/61/006/009/018/018
D201/D302

26.2340

AUTHORS: Aleskovskiy, Yu.M., and Granovskiy, V.L.

TITLE: Spectroscopic determination of deionization speed of cesium vapor in a magnetic field

PERIODICAL: Radiotekhnika i elektronika, v. 6, no. 9, 1961, 1590 - 1592

1590

TEXT: In this short communication the authors present the results of their experimental evaluation of the influence of a magnetic field on the recombination losses of charged particles in a volume of decaying plasma. The experiment consisted of measuring the recombination radiation from cesium plasma in the region of boundary continuum with a limit of 4940 A°$_1$ which corresponds to the capture of electrons by the cesium ions to the level $C_s 6P_{1/2}$. The cesium plasma was formed by an arc discharge in a tube 2.5 cm diameter and 40 cm long, energized by a pulsating unidirectional current at the mains frequency. In phase with the peak current, a thyratron, in

Card 1/3

Spectroscopic determination of ...

S/109/61/006/009/018/018
D201/D302

shunt with the tube, was fixed cutting off the current. The tube was placed in a solenoid producing a homogeneous magnetic field up to 1300 oersted. The plasma radiation was focussed onto the input slot of a monochromatic illuminator. Its output, after photomultiplication was applied to a CRO, the time base of which was triggered in synchronism with the start of the de-ionization process. In order that the plasma decay start at an equal concentration of charged particles, the initial radiation intensity at $H = 0$ and $H \neq 0$ was equalized by adjustments of the discharge current. The changes are shown of the intensity of re-combination radiation I during the process of de-ionization of cesium vapor, as well as the ratios of the number of particles $N_R(H)/N_R(0)$, disappearing as a result of radiation recombination at $H = 1300$ oersted and $H = 0$. It shows that at low pressures the magnetic field markedly increases the quantity of changed particles recombining due to radiation in a given volume of gas. It is stated in conclusion that direct spectroscope observations have shown the magnetic field increases the mean life time of charged particles and by slowing down the

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28535
S/109/61/006/009/018/018

Spectroscopic determination of ...   D201/D302

rate of diffusion decay of plasma, increases the recombination
losses of changes in the gas volume. There are 2 figures, 2 tables,
and 8 references: 6 Soviet-bloc and 2 non-Soviet-bloc. The referen-
ces to the English-language publications read as follows: W. Bostik
M. Levine, Phys. Rev. 1959, 97, 13; F. Moehler, C. Boeckner, J.
Res. Nat. Bur. Standards. 1929, 2, 489.

ASSOCIATION: Fizicheskiy fakul'tet Moskovskogo gosudarstvennogo
             universiteta im. M.V. Lomonosova (Moscow State Univer-
             sity im. M. V. Lomonosov, Faculty of Physics)

SUBMITTED: April 18, 1961

Card 3/3

9,4120 (1003,1105,1140,1049)

AUTHORS: Fedoseyeva, L. A., Granovskiy, V. L.

TITLE: Cooling of an electron gas in a decaying mercury plasma

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 31, no. 3, 1961, 357-366

TEXT: The present paper deals with the decrease of the electron tempera-
ture T_e in the initial stages of cooling (in a period 0 - 400 μ sec after
disconnection of the electric discharge field). In addition, a second
problem has been solved: The authors determined the decrease in concen-
tration n_e of the free electrons and compared it with the decrease in
concentration of the positive ions. Thus, both methods of studying
the de-ionization of a gas were intercompared. The investigations
were carried out in the plasma of a low-pressure arc in mercury vapor
under the following conditions: Vapor pressure $10^{-3} - 5.8 \cdot 10^{-2}$ mm Hg,
amplitude of the discharge current 1.3 a, tube diameter 65 mm. De-ioniza-
tion was studied by oscillographic observation of the current through
a probe inserted into the plasma. When the instant t_1 is properly chosen,
Card 1/8

Cooling of an electron gas in ...   S/057/61/031/003/015/019
                                                 B125/B209

the values of the probe current at $t = t_1$ may be determined from all
oscillograms taken at different U_{probe}. The same characteristics were
plotted also for other t values. From these characteristics, the authors
determined T_e and n_e at various times t, and thus $T_e(t)$ and $n_e(t)$. The
simplified circuit diagram of the arrangement is shown in Fig. 1. Fig. 2
shows four probe oscillograms taken at the same p_o and the same current
in the tube, but at different U_{probe} (probe potential):
a) For $U_{probe} = -25$ v (with respect to the other probe) an ion current
which is constant until the current in the tube breaks, flows to the
probe, after which it decreases on account of de-ionization.
b) For $U_{probe} = -8.2$ v the same holds, but the current flowing to the
probe is weaker than in case a). c) For $U_{probe} = -5.9$ v, the current
flowing to the probe is predominant in the arc stage. After breaking
of the arc, the ion current flowing to the probe vanishes gradually, and
a decreasing ion current is left. d) For $U = -1.3$ v, an ion current

Card 2/8

Cooling of an electron gas in ...

is continuously flowing to the probe. At the vapor pressures $p_o = 1 \cdot 10^{-3}$ (20°C), $\sim 5 \cdot 10^{-3}$ (40°C), $17 \cdot 10^{-3}$ (60°C), $\sim 58 \cdot 10^{-3}$ (80°C), 15 to 18 oscillograms each were taken at least, and from these the probe characteristics with a spacing of 20 μ sec were drawn (Fig. 4). T_e de-creases quickly and then slowly, and from the curvature of the probe characteristics one may ascertain the absolute electron concentration n_e at different times t. Tables 1 and 2 show the initial constants of time t_o of the concentration drop as determined by both methods. The agreement of these results proves the measurements during de-ionization to be correct. An investigation of the time dependence of T_e and n_e during de-ionization of the discharge plasma in the pressure range of from 1 to $58 \cdot 10^{-3}$ mm Hg at a discharge current of 1.3 a in a 65 mm thick tube showed the following: 1) The simple method of determining τ_o from an oscillogram of the ion current impinging upon the probe at constant probe potential is reliable. 2) In the initial stage of ionization, T_e decreases the faster, the higher the pressure. 3) The difference $T_e - T_g$ in the

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Cooling of an electron gas in...   S/057/61/031/003/015/019
                                                     B125/B209

process of de-ionization decreases gradually, but even after 400 μ sec of
thermal equilibrium a mercury discharge does not occur in the plasma. The
final temperature of the electrons attained during this time is the
lower, the higher the pressure. In the initial stage of the process, in-
elastic collisions of first kind play the principal part in gas cooling
at all pressures examined and at $1 - 5.10^{-3}$ mm Hg during the whole time
$(0 - 400 \mu$ sec). Elastic collisions are predominant at $p > 10.10^{-3}$ mm Hg
in all later stages of the process. 5) The metastable atoms as the only
energy reservoir of the electrons in the decaying plasma play an important
part in the initial and final stages of the process. There are 5 figures,
4 tables, and 12 references: 6 Soviet-bloc and 6 non-Soviet-bloc.   The
two most recent references to English-language publications read as
follows: F. Mohler, Journ. Res. Bur. Stand. 19, 447, 1937; J. H. Simons,
R. P. Seward, Journ. Chem. Phys., 6, 790, 1938.

ASSOCIATION: Vsesoyuznyy elektrotekhnicheskiy institut im. V. I. Lenina
               Moskva (All-Union Institute of Electrical Engineering
               imeni V. I. Lenin, Moscow)

SUBMITTED: June 6, 1960
Card 4/8

27185

S/056/61/041/002/006/028
B102/B205

26.2340
AUTHORS: Aleskovskiy, Yu. M., Granovskiy, V. L.

TITLE: Recombination radiation of cesium plasma in a homogeneous
              magnetic field

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41,
              no. 2 (8), 1961, 363 - 367

TEXT: From a theoretical point of view, the presence of the positive
column of a gas discharge in a longitudinal magnetic field ($H=H_z$) probably
has the following effects: decrease of the diffusion of carriers toward the
wall, increase of the lifetime and concentration, n_e, of carriers, drop of
the electron temperature T_e, and increase of the volume recombination proba-
bility and of the intensity, I, of recombination radiation. Some of these
assumptions were confirmed by probe measurements in helium. Studies of
L. Davies on the behavior of cesium plasma with respect to recombination in
a longitudinal field, however, showed that I and n_e did hardly change when

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27165

S/056/61/041/002/006/028
B102/B205

Recombination radiation of ...

the field was applied, whereas T_e increased. In order to clarify this phenomenon, the authors have now studied the recombination incandescence in cesium-vapor plasma with the use of a spectrophotometer. Probe measurements were made simultaneously. The cylindrical probe was placed on the axis of the discharge tube (2.5 cm in diameter and 40 cm in length), in which a Cs pressure of $2 \cdot 10^{-3} - 0.13$ mm Hg prevailed. Photometric measurements were done at certain points of the recombination continuum within the range 4940 - 4400 Å. In the absence of a field, I was approximately proportional to n_e^2. Application of the magnetic field resulted in a sharp rise of I, especially at low pressures (cf. Table). With a rise in I there occurred a contraction of the column, which was intensified with decreasing Cs pressure. The diagrams $\ln[\nu I(\nu)] = f(\nu)$ (straight lines) indicate that Maxwellian electron distribution prevailed in the plasma. The electron temperatures T_e obtained therefrom are also given in the Table, and are compared with values obtained by probe measurements at H = 0. With growing

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Recombination radiation of...

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S/056/61/041/002/006/028
B102/B205

H_z and with a constant current n_e was found to increase the more, the lower
the gas pressure. The electron temperature dropped more sharply, the lower
the pressure. At higher pressure (0.13 mm Hg) and in the presence of fields
of up to 1300 oe, the latter practically had no effect any longer. The
results obtained here are fully consistent with those following from the
theory of diffusion. The rise in I caused by the application of a field is
attributed 1) to the contraction of the column and to the increase in
electron concentration, and 2) to the drop of T_e. The effect of the drop
of T_e accounts for about 10%. The effect of different current densities
may be seen from the following data:

$(p = 1,2 \cdot 10^{-1}$ мм рт. ст., $H = 1300$ Oe):

j, A/см^2;	0,2	0,3	0.4	0,5	0,6	0,7	0,8	1,0
$I(H)/I(0)$:	20	18,5	14,2	11,5	8,8	5,7	3,8	2,9
$n_e(H)/n_e(0)$	4,4	4,0	3,6	3,2	2,8	2,25	1,74	1,64

These data explain the result obtained by Davies, who applied low current

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27185

Recombination radiation of...

S/056/61/041/002/006/028
B102/B205

densities. There are 3 figures, 1 table, and 11 references: 4 Soviet and 7 non-Soviet. The most important reference to English-language publications reads as follows: L. Davies. Proc. Phys. Soc. $\underline{B66}$, 33, 1953.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University)

SUBMITTED: March 20, 1961

Legend to the Table: (1) Pressure in 10^{-3}mm Hg; (2) T_e according to the spectrum; (3) T_e according to the probe current at H=0. The data were obtained at j = 0.5 a/cm^2.

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26691
$S/056/6i/041/005/006/038$
B109/B102

$24.2120 \ (1538, 3617, 3717, 1163)$

AUTHORS: Urazakov, E. I., Granovskiy, V. L.

TITLE: Determination of the $\omega_H\tau$ values and the effective collision frequencies of plasma electrons and ions in a magnetic field

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 5(11), 1961, 1375 - 1377

TEXT: Measurements of $\omega_H\tau$ for ions and electrons of an argon plasma column were carried out at various gas pressures. The arrangement provided a 37 mm wide argon-filled tube, a magnetic field of 400 oersted, and a discharge current of 500 ma. In order to determine the effect of the longitudinal magnetic field upon the plasma electrons and ions as well as to ascertain the mean collision frequencies ν_e and ν_p (subscripts e and p for electrons and ions, respectively) it is sufficient to measure the current densities in the direction of the wall (j_{er}, j_{pr}) and in the azimuthal direction ($j_{e\varphi}$, $j_{p\varphi}$) at one and the same spot in the plasma. The resulting data may be evaluated with the aid of the formulas

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26691
S/056/61/041/005/006/038
B109/B102

Determination of the $\omega_H\tau$ values and ...

$$j_{p\varphi}/j_{pr} = v_{p\varphi}/v_r = \omega_{Hp}\tau_p \quad \text{and}$$
$$j_{e\varphi}/j_{er} = v_{e\varphi}/v_r = \omega_{He}\tau_e \quad .$$

The current density measurements were carried out by means of the plane probes shown in Fig. 1. Probe no. 1 measures j_r (plane perpendicular to the radius), probe no. 2 measures the φ- component (plane of the probe parallel to the z-r-plane). v_e and v_p could be determined from these data (Table). The results lead to the conclusions: (a) The effect of a magnetic field of 400 oersted upon the electrons $\omega_H\tau$ is considerable up to $p \leq 1$ mm Hg, for ions it is small also at $p \approx 5 \cdot 10^{-3}$ mm Hg. (b) v_p grows linearly with p, so that the mean ion velocity is practically constant. There are 2 figures, 1 table, and 5 references: 3 Soviet and 2 non-Soviet. The reference to the English-language publication reads as follows: S. C. Brown. Basic Data of Plasma Physics. N. Y.. Wiley, 1959.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University)

Card 2/4

GRANOVSKIY, Veniamin L'vovich, doktor fiziko-matem. nauk, prof.;
        VERES, L.F., red.; DUBROVSKIY, Ye.V., red.; ATROSHCHENKO,
        L.Ye., tekhn. red.

        [New ways for obtaining electric power] Novye puti polucheniia
        elektricheskoi energii. Moskva, Izd-vo "Znanie," 1962. 47 p.
        (Vsesoiuznoe obshchestvo po rasprostraneniiu politicheskikh i
        nauchnykh znanii. Ser.4, Tekhnika, no.22)   (MIRA 15:2)
                  (Electric generators)

L 15725-63 EPF(c)/EWT(1)/EWP(q)/EWT(m)/EDS/ESC(b)-2/ES(v)-2 AFFTC/ASD/

ESD-3/AFWL/IJP(C)/SSD Pab-4/Pi-4/Po-4/Pr-4 JD 8/0124/63/000/005/B016/B016

ACCESSION NR: AR3002664

SOURCE: Rzh. Mekhanika, Abs. 5B80

AUTHOR: Vasil'yeva, I.A.; Granovskiy, V. L.

TITLE: New data on the influence of a magnetic field on ion drift from a plasma of inert gases

CITED SOURCE: Sb. Vopr. magnitn. gidrodinamiki i dinamiki plazmy. v. 2. Riga, AN LatvSSR, 1962, 403-409

TOPIC TAGS: ion drift, plasma, ion, drift, inert gas, magnetic field, striation, diffusion coefficient, wall probe

TRANSLATION: A study was made of the drift of ions from a plasma to the wall in the presence of a magnetic field. The drift of the ions from the plasma is characterized by an ion current density at the wall of the tube j . The diffusion coefficient is determined from the relation, $j = - Dd\rho/dr$, where ρ is the density of charge of positive ions near the wall. The tube is made of glass, and contained an oxide cathode and a conical anode. The ion current at the wall

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L 15725-63

ACCESSION NR: AR3002664 O

is determined by a plane wall probe in the form of a disc. For the determination
of the gradient of the density, an adjustable cylindrical probe was used. Helium
and argon at pressures from $5 \cdot 10^{-3}$ to 1.1 mm mercury were studied. The field
was varied from 0 to 2600 gauss, and the current in the tube from .03 to 1 amp.
          The experiments showed that the diffusion of ions and electrons
corresponds to the theory of pair collisions, and is antipolar, while the field
is less than some critical B_c. The diffusion coefficient here monotonically falls
with the growth of the field. For $B > B_c$ an anomaly is observed in the de-
pendence $D(B)$ and $j(B)$ and B_c grows with the increase in pressure. In the
anomalous region a current maximum appear and diffusion currents depending on the
field. The anomaly is related to the appearance of the random electrical
oscillations in the plasma. Striations do not show any effect on the process.
The hypothetical effect of "short circuiting" of the plasma, introduced by Kaiman
to explain the large drift velocity of the ions perpendicular to the magnetic
field is not observed. Yu.R.

DATE ACQ: 14Jun63   SUB CODE: PH   ENCL: 00

Card   2/2

L 15718-63   EPR/EPA(b)/EWT(1)/EPF(n)-2/EWG(k)/BDS/T-2/EEC(b)-2   AFFTC/ASD/
ESD-3/AFWL/IJP(C)/SSD Ps-4/Pd-4/Pu-4/Pz-4/Pi-4/Po-4 WW/AT
ACCESSION NR: AR3002657   8/0124/63/000/005/B012/B012

SOURCE: Rzh. Mekhanika, Abs. 5B54

AUTHOR: Musin, A.K.; Granovskiy, V. L.

TITLE: Study of the motion of a conducting gas accelerated by crossed electrical and magnetic fields

CITED SOURCE: Sb. Vopr. magnitn. gidrodinamiki i dinamiki plazmy. v. 2. Riga, AN LatvSSR, 1962, 411-417

TOPIC TAGS: plasma, viscosity, electric field, magnetic field, saturation, gas magnetohydrodynamics

TRANSLATION: A study is made of the motion of small viscosity (much less than the magnetic viscosity) plasma, with small conductivity, in crossed electrical and magnetic fields under a condition of constant total pressure along the 3rd axis. By solving the magnetohydrodynamic equations, the drift velocity, which is proportional to the electrical field and which has the form of a curve with its saturation depending on the magnetic field was found. The saturation is caused

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L 15718-63
ACCESSION NR: AR3002657

O

by the fact that for $H > H_{cr}$ the additional accelerating action of the magnetic field is completely balanced by the magnetic viscosity. Curves for the drift velocity for $\sigma \approx 10^{13}$ sec^{-1}, H, varying from 400 to 5000 oersteds and gas pressure from 10 to 1000 microns of mercury are drawn. Under these conditions the limiting drift velocity proves to be of the order of $2.4 \cdot 10^{7}$ cm/sec.
V.I. Vladimirov

DATE ACQ: 14Jun63   SUB CODE: PH   ENCL: 00

Card 2/2

AUTHORS: Golubev, V.S., and Granovskiy, V.L.

TITLE: On the theory of diffusion waves in plasma placed in a
              longitudinal magnetic field

TEXT: The diffusion of charge carriers in a quiescent gas is dis-
cussed in terms of the diffused waves in the two cases, with and
without the magnetic field. Wave diffusion takes place in a long
gas-filled cylindrical tube having at its input a plasma source the
concentration of which varies periodically. The diffusion velocity
of the charged particles and its coefficient can be calculated by
measuring the amplitude and phase of the variable concentration
component at various points of the tube axis. The waves described
here differ from other wave modes of plasma concentration by the
mechanism of its origin and propagation. These waves originate by
the periodically-varying entry of charge carriers into the gas,
they cannot originate in the plasma spontaneously; the wave distri-
Card 1/2

On the theory of diffusion waves ...   S/109/62/007/004/009/018
                                          D230/D302

bution is determined entirely by the ambipolar diffusion of charge
carriers and it is not related to electron temperature variations
and the appearance of new regions of collision ionization. In the
case of very small gas pressures when an ion, moving in an ambipo-
lar electric field along the length of a free path, gains energy
compared with its temperature energy the carrier equilibrium compa-
rison cannot be written down in the form of the diffusion differen-
tial equation. Further discussion about the limiting conditions in
application of the theory gives conclusions about the operating pa-
rameters for low gas pressures, for large pressures and for consi-
derable concentrations of charged particles. There are 5 figures
and 8 references: 7 Soviet-bloc and 1non-Soviet-bloc. The referen-
ce to English-language publication reads as follows: L. Tonks, Phys.
Rev., 1941, 59, 522.

ASSOCIATION: Fizicheskiy fakul'tet Moskovskogo gosudarstvennogo uni-
             versiteta im. M.V. Lomonosova, kafedra elektroniki
             (Faculty of Physics, Moscow State University im. M.V.
             Lomonosov, Department of Electronics)

SUBMITTED: October 25, 1961
Card 2/2

24.I/10

S/109/62/007/005/015/021
D201/D308

AUTHORS: Golubev, V.S., and Granovskiy, V.L.

TITLE: An experimental study of diffusion waves of charged
particles in a quiescent gas inside a magnetic field

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 5, 1962,
880 – 889

TEXT: The authors describe an experimental verification of the
theory of diffusion waves in a magnetic field, as given by them
earlier (Radiotekhnika i elektronika, 1962, 7, 4, 663) and attempt
to confirm in this way the dependence of the coefficient of ambipo-
lar diffusion on the magnetic field, which dependence results from
the theory of binary collisions. The ambipolar diffusion of elec-
trons and ions in rarified He and A, occurring along a cylindrical
tube was investigated in various conditions: at a constant concen-
tration at the beginning of the tube (a stationary diffusion stream)
at a periodically changing concentration (concentration waves), in
the absence and in the presence of an axial magnetic field. In the
absence of magnetic field the plasma parameters were measured both

Card 1/3

An experimental study of diffusion ...   S/109/62/007/005/015/021
                                              D201/D308

by the twin- and the Langmuir-probe methods. In the presence of mag-
netic field the current of a twin-probe only was measured. The mea-
surements were carried out in He and A, at pressures 0.03 - 1 mm Hg,
discharge currents 0.3 - 1 A, plasma concentrations n $\approx$ 107 - 1010
cm^{-3}, magnetic fields up to 1400 oersted and modulating frequencies
40 - 10.000 c/s. The decrease in the concentration and temperature
of electrons in a stationary diffusion stream and the attenuation
of concentration waves were measured as functions of the magnitude
of the magnetic field, frequency of the wave and of other experimen-
tal conditions. The results prove the validity of the theory of dif-
fusion waves in plasma as given by the authors and by O.R. Konenko
in 1960. The method of diffusion waves makes it also possible to de-
termine by a novel method the dependence of the coefficient of trans-
verse diffusion on the magnetic field, which dependence, for fields
up to 1500 oersteds, remains in good agreement with the theory of
binary collisions. A detailed description of the experimental T-sha-
ped tube, the experiment procedure and comparison of results obtai-
ned with those cited in both Soviet-bloc and non-Soviet-bloc litera-
ture are given. There are 9 figures and 2 tables.

Card 2/3.

An experimental study of diffusion ...   S/109/62/007/005/015/021
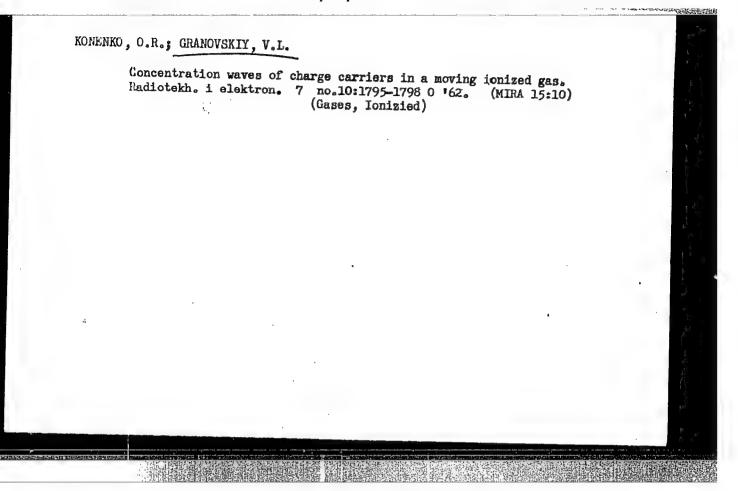   D201/D308

ASSOCIATION: Fizicheskiy fakul'tet Moskovskogo gosudarstvennogo uni-
             versiteta im. M.V. Lomonosva. Kafedra elektroniki
             (Moscow State University im. M.V. Lomonosov, Faculty
             of Physics, Department of Electronics)

SUBMITTED: November 13, 1961

Card 3/3

KONENKO, O.R.; GRANOVSKIY, V.L.

Concentration waves of charge carriers in a moving ionized gas.
Radiotekh. i elektron. 7   no.10:1795-1798 0 '62.   (MIRA 15:10)
(Gases, Ionizied)

ALESKOVSKIY, Yu.M.; GRANOVSKIY, V.L.

Volume recombination in a helium plasma in a magentic field.
Zhur. eksp. i teor. fiz. 43 no.4:1253-1261 O '62. (MIRA 15:11)

1. Moskovskiy gosudarstvennyy universitet.
(Plasma (Ionized gases))
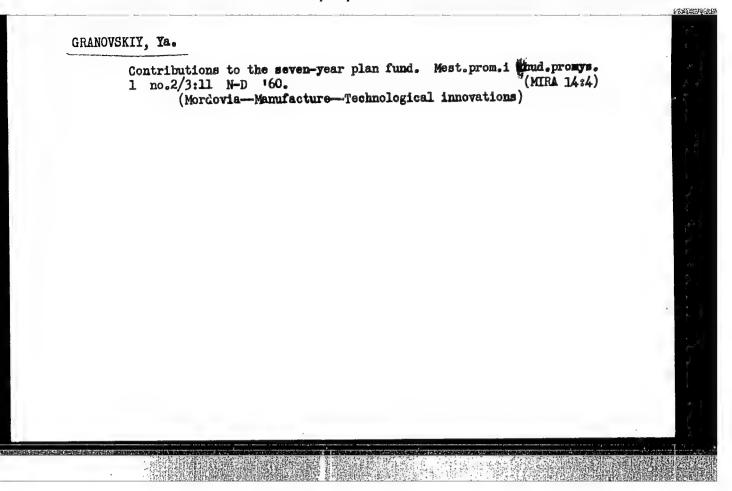(Magnetic fields)

URAZAKOV, E.I.; GRANOVSKIY, V.L.

Transverse (Hall) diffusion in a plasma of inert gases. Zhur.
eksp. i teor. fiz. 45 no.5:1285-1293 N '63. (MIRA 17:1)

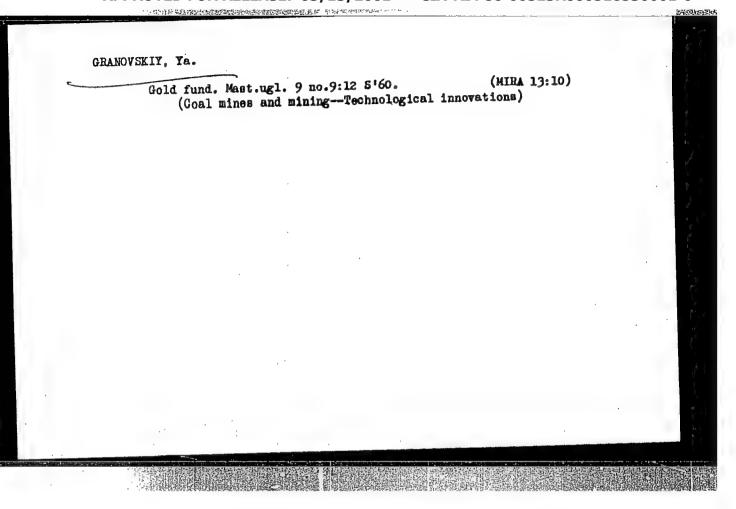1. Moskovskiy gosudarstvennyy universitet.

GRANOVSKIY, V.N., inzh.

Practice of controlling dust in the air of an asbestos mill. Sbor. rab. po silik. no.3:171-175 '61. (MIRA 15:10)

1. Asbestoobogatitel'naya fabrika No.5 tresta Soyuzasbest.
   (Asbestos)   (Dust--Removal)

GRANOVSKIY, Ya.

Contributions to the seven-year plan fund. Mest.prom.i kmud.promys.
1 no.2/3:11 N-D '60.   (MIRA 14:4)
          (Mordovia—Manufacture—Technological innovations)

GRANOVSKIY, Ya.

Gold fund. Mast.ugl. 9 no.9:12 S'60.   (MIRA 13:10)
(Coal mines and mining--Technological innovations)

GANDZYUG, S. (Khabarovsk); TKACHENKO, I.; SHASHUNOV, I.; GRANOVSKIY, Ya.;
    IGLIN, A.; BORYCHEV, N.

Technological information. Okhr.truda i sots.strakh. 6
no.1:34-37 Ja '63.   (MIRA 16:1)

1. Starshiy inspektor otdela okhrany truda Vsesoyuznogo
tsentral'nogo soveta professional'nykh soyuzov (for Iglin).
2. Zaveduyushchiy otdelom okhrany truda Tsentral'nogo komiteta
professional'nogo soyuza rabochikh ugol'noy promyshlennosti
(for Borychev).
                    (Technological innovations)
                    (Safety appliances)

21(1)

AUTHOR: Granovskiy, Ya. I.

SOV/56-36-2-46/63

TITLE: Concerning the Problem of the ρ^0-Meson (K voprosu o ρ^0-mezone)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959,
Vol 36, Nr 2, pp 623-624 (USSR)

ABSTRACT: In the compound model of the elementary particles which is
based on the idea of Fermi-Yang (Ref 1), the pion is represented
as a system consisting of a nucleon strongly interacting with an
antinucleon. Besides the pion triplet, the isotopic singlet

$\rho^0 = (\langle p\bar{p}\rangle + \langle n\bar{n}\rangle) / \sqrt{2}$ may, however, be formed from the same
"bare" particles. The fact that such a particle is not observed
experimentally requires an explanation. Okun' (Ref 3) suggests
that the mass of the ρ^0-meson is sufficiently high. Perel'man
(Ref 5), however, assumes that $M_{\rho^0} \sim M_{\pi^0}$. Because of the dif-

ferent values of the isotopic spins, the forces connecting the
nucleon and the antinucleon in the π^0- and ρ^0-mesons will be
different as well. In the symmetrical variant, for example, the

interaction potential $V = a\vec{\tau}_1\vec{\tau}_2$ equals a for T = 1 and -3a for

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Concerning the Problem of the ϱ^o-Meson   SOV/56-36-2-46/63

$T = 0$. In this case, the existence of a pion would exclude the existence of a ϱ-meson. The introduction of a component which does not depend on T cannot alter this conclusion because of the smallness of these forces. Perel'man calculated the mass difference for particles of equal value of the isotopic spin. $\Delta M = 12.7\ m_e$, in particular, is the difference between the masses of the $\pi^{\pm}$- and π^o-mesons. By taking account of the magnetic interaction, the calculated mass difference is approximated to the experimental value $\Delta M = 9m_e$. There are 6 references, 2 of which are Soviet.

ASSOCIATION: Institut yadernoy fiziki AN Kazakhskoy SSR (Institute of Nuclear Physics AS Kazakhskaya SSR)

SUBMITTED: October 22, 1958

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21(1), 21(7)

AUTHORS: Granovskiy, Ya. I., Chasnikov, I. Ya.   SOV/56-36-4-24/70

TITLE: On the Analysis of Showers of High Energy
           (K analizu livney bol'shoy energii)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959,
            Vol 36, Nr 4, pp 1119-1122 (USSR)

ABSTRACT: The present paper was inspired by two Italian papers
            (Refs 1, 2) in which the energy dependence of shower
            particles upon the angle of departure of these particles
            had been investigated in the laboratory system. The
            authors found a bivalent dependence, which was explained
            by assuming double- or multiple collisions between the
            primary particle with the nucleons of the target nucleus
            in an interaction. The authors of the present paper
            point out that, if the existence of multi-charged shower
            particles is assumed, a bi- or multivalence of this
            dependence may also occur (the case of a shower formed
            from multi-charged particles was discovered and dealt
            with in the laboratory of the authors). $pv = f(1/\sin\theta)$
            describes for the case of multi-charged particles two
            curves (Fig 1). Such a bivalence was found to exist also

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On the Analysis of Showers of High Energy

by Boos, Vinnitskiy et al. (Ref 3) for showers in (N,N)-collisions. In the present paper the authors show that this kind of energy dependence on the angle of departure can be kinematically explained for certain showers without any assumptions as to the interaction mechanism of primary particles with one or several nucleons of the target nucleus. For $V_c > V^*$ (V_c = velocity of the center of mass system, V^* = particle velocity in the c.m.s., p = particle momentum, θ = spatial angle of departure of particles in the laboratory system) an expression is derived for $E/m = y$ by means of the Lorentz transformation $E^* = \gamma_c(E - pV_c \cos \theta)$, $\gamma_c = 1/\sqrt{1 - V_c^2}$, and in several diagrams for various γ_c the dependence of y-values on the x-values ($x = 1 - V_c^2 \cos^2 \theta$) is represented. With $a = E^*/m\gamma_c$ and $E = \gamma_c(E^* + p^* V_c \cos \theta')$ it holds for $\theta^* = 90°$ that $y = \gamma_c^2 a$. By using these

Card 2/3   equations the authors show the possibility of obtaining

On the Analysis of Showers of High Energy   SOV/56-36-4-24/70

a more precise determination of γ_c which takes the
energy of angular distribution of the flying-off
particles into account. The authors finally thank Zh. S.
Takibayev for his interest and valuable comments.
There are 3 figures and 5 references, 3 of which are
Soviet.

ASSOCIATION: Institut yadernoy fiziki Akademii nauk Kazakhskoy SSR
(Institute for Nuclear Physics of the Academy of Sciences,
Kazakhskaya SSR)

SUBMITTED: September 6, 1958

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24(5)

AUTHOR: Granovskiy, Ya. I.   SOV/56-36-4-29/70

TITLE: The Mass Spectrum of Mesons in the Heisenberg Theory (Spektr mass mezonov v teorii Gayzenberga)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 4, pp 1154-1158 (USSR)

ABSTRACT: In the present paper the author investigates agreement between Heisenberg's theory and experimental results concerning the meson spectrum. The question is investigated in this connection as to the form of the nonlinear term $\pm \xi l^2 (\bar\psi O_n \psi)(\bar\psi O_n \psi)$ in the Heisenberg Lagrangian, i.e. what sign and what form of the matrix O_n leads to results that are the nearest approach to experimental results. All calculations are carried out in an approximation that corresponds to the first approximation in the Tamm-Dancoff method. Calculation results are given by tables 1 and 2 for S, V, T, A and P variants. It was found that, whereas, e.g., the mass of the pseudoscalar meson theoretically assumes a value that exceeds the experimentally determined value by 2 to 3 times its amount, the scalar variant still leads to the best agreement, i.e. the deviation is only $\sim 25\%$.

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The Mass Spectrum of Mesons in the Heisenberg
Theory   SOV/56-36-4-29/70

Though taking isotopic properties into account improves the
results obtained with respect to masses, it at the same time
leads to difficulties in the case of charged mesons. Within

the framework of the Lagrangian $L = \bar{\psi}\gamma_\mu \nabla_\mu \psi + \bar{\chi}\gamma_\mu \nabla_\mu \chi - l^2(\bar{\psi}O_n\chi)(\bar{\chi}O_n\psi)$

("realistic model") elimination of these difficulties is
possible only by variation of the isotopic structure of the
commutation function $S^\gamma(\gamma)$. The author finally thanks Professor
W. Heisenberg and Doctor H. Mitter for placing data at his
disposal, and I. G. Golyak for assisting in carrying out
calculations in the first part of this paper. There are 2
tables and 5 references, 1 of which is Soviet.

ASSOCIATION: Institut yadernoy fiziki Akademii nauk Kazakhskoy SSR (Insti
               for Nuclear Physics of the Academy of Sciences, Kazakhskaya SSR)

SUBMITTED: October 4, 1958

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16(2)
AUTHOR: Granovskiy, Ya. I.   SOV/56-36-4-50/70

TITLE: Simplification of the Calculated Formulas for the Estimation of Statistical Weight (Uproshcheniye raschetnykh formul dlya vychisleniya statisticheskogo vesa)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 4, pp 1303-1304 (USSR)

ABSTRACT: A calculation of the statistical weight has already been carried out by several papers; the complete results were obtained by Belen'kiy, Maksimenko, Nikishov, and Rozental' (Ref 2). The author gives a considerably simplified version of the formula derived in reference 2:

$$W_N = \int d\vec{p}_1 \ldots d\vec{p}_N \delta(\Sigma \vec{p}_k - \vec{P}_0)\delta(\Sigma E_k - E_0) =$$

$$(2\pi)^{-4} \int d\vec{\tau} \exp\left\{-i\tau_\mu \vec{P}^0_\mu\right\} \times \prod_k \int d\vec{p}_k \exp\left\{ i(\tau\vec{p}_k - \tau_0 E_k)\right\} \text{ where}$$

$$\tau_\mu p^0_\mu = \vec{\tau}\,\vec{P}_0 - \tau_0 E_0$$

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The simplification has the form

$$W_N = (2\pi)^{-4}\, \frac{\pi^2}{i}\left(-8\pi\frac{\partial}{\partial E_o}\right)^N \int_0^\infty \frac{\alpha_1 d\alpha_1 \cdots \alpha_N d\alpha_N}{(\alpha_1 + \cdots \alpha_N)}\ \exp\left\{-i\,\frac{\vec{P}_o^2 - E_o^2}{4(\alpha_1 + \cdots \alpha_N)} - \frac{i}{4}\sum_k \frac{m_k^2}{\alpha_k}\right\}$$

or

$$W_N = \frac{1}{i\pi^2}\left(-\frac{\pi}{2}\frac{\partial}{\partial E_o}\right)^N \left(E_o^2 - \vec{P}_o^2\right)^{2N-2} \int_0^\infty \frac{\beta_1 d\beta_1 \cdots \beta_N d\beta_N}{(\beta_1 + \cdots \beta_N)}\ \exp\left\{\frac{i}{\beta_1 + \cdots \beta_N} - \frac{i\nu_1^2}{\beta_1} - \cdots \frac{i\nu_N^2}{\beta_N}\right\}$$

with $\nu_k^2 = m_k^2/(E_o^2 - \vec{P}_o^2)$ which for $\nu_k^2 = 0$ assumes the form

$$W_N^{(0)} = \left(\frac{\pi}{2}\right)^{N-1} \frac{(4N-4)!}{(3N-4)!}\ \frac{E_o^{3N-4}}{(2N-2)!\,(2N-1)!} \quad \text{with } \vec{P}_o = 0, \text{ and for}$$

$\nu_k^2 \neq 0$ if $\exp(-i\sum \nu_k^2/\beta_k)$ is expanded in series and is broken

off after the second term, it holds that

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